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Toxic Salivary Glands in the Primitive Insectivore *Solenodon*

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In 1942 O. P. Pearson demonstrated the toxic property of the saliva of *Blarina brevicauda*, a common shrew of the eastern United States, and identified its principal source as the submaxillary gland. Comparative studies at that time and subsequently revealed that similar poisonous factors were not present in the salivary glands of other soricid and talpid insectivores (Pearson, 1942, 1950, 1956). I had an unexpected opportunity to make a crude check on the salivary glands of *Solenodon paradoxus*, a remote relative of the shrews, when three of these animals died at the Chicago Zoological Park within two months after their arrival in 1958 from the Dominican Republic.

Parts of the submaxillary and parotid glands of one animal that had died one to two hours beforehand were ground separately with sand, diluted to 10 per cent by weight solutions with 0.9 per cent NaCl solution, and filtered, following the procedure of Pearson (1942). These solutions were injected into a small series of male white mice that ranged in weight from 29 to 44 grams.

All of the mice injected with extract from submaxillary gland showed some reaction at least urination and irregular or rapid breathing for several minutes. Five that received intravenous doses of extract of .09 to .38 mg. submaxillary gland per gram of body weight did little more than this and recovered within 30 minutes. Five that received intravenous doses of .38 to .55 mg. per gram additionally exhibited protruding eyes, gasping, and convulsions before dying within two to six minutes. Two animals that had intraperitoneal injections of extract of .56 and .66 mg. per gram died in about 12 hours, and one injected at the level of 1.02 mg. per gram died in 13 minutes. Urination, cyanosis, and depression were observed in these animals. Three "control" mice injected intravenously with extract of 1.02, 1.68, and 1.87

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mg. of parotid gland per gram of body weight showed no distress except for initially very rapid breathing in the last case.

In general these results are very like those described for *Blarina* extracts. It may be noted that the twentyfold lesser potency evident here of *Solenodon* extract as compared to that of *Blarina* may be due to postmortem inactivation of the toxic principle as reported by Ells and Krayner (1955) for fresh *Blarina* material. Further tests with the refined techniques of these authors using acetone treated glands will be necessary for a fairer assessment of the potency of *Solenodon* toxin.

Sections were made of the submaxillary glands and stained with hematoxylin and eosin and also with a modification of Mallory's triple stain. These sections showed some large cells with coarse acidophilic granules and small nuclei in the secretory ducts. Pearson (1950) suspected that such cells in *Blarina* might be concerned in the production of the saliva's toxic principle, although somewhat similar cells are found in other soricids.

The submaxillary glands of *Solenodon* are rather enormous and conspicuous structures (see fig. 47 in Mohr, 1938) . Each gland weighs three to four grams in adult animals. According to Allen (1910), the duct of the submaxillary gland ends at the base of the large deeply channeled second incisor tooth of the lower jaw (see fig. 19D in McDowell, 1958) . Presumably toxic saliva would be conducted thereby into a wound. I could not induce *Solenodon* to bite live mice and therefore have no direct evidence on this point. However, in 1877 Gundlach reported inflammatory effects of bites by Cuban *Solenodon* to himself and a mountaineer (although he dismissed the possibility of venomous action on the basis of authority!) . Of his hand bite he said: ". . . I was bitten by the tame individual, which gave me four wounds corresponding to the [large] incisors: those from the two upper incisors healed well, but those from the lower ones inflamed."

Moreover, there are indications that *Solenodon* is not immune to its own venom. Autopsy of the third animal disclosed multiple bite wounds on the feet and no obvious internal evidence of other causes of death. Sections of the liver show considerable congestion in that organ. The snout, lips, limbs, and tail were very pale the afternoon preceding death. Mohr (1937, 1938) gave accounts of several cases in which death was the outcome of fighting with cage mates although only slight foot wounds were inflicted. Pearson (1950) reported that *Blarina* was relatively immune to its own venom, although the single test animal died and the interpretation was problematical. The utility of the venom for

Solenodon in its natural environment is unknown and is certainly not indicated by its insectivorous habits. The explanation may be phylogenetic and historical rather than one of present-day function.

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